

# Structural and spectroscopic analyses of ancient black pigments from Roman archaeological sites

M. C. Gamberini<sup>1\*</sup>, P.-O. Autran<sup>2,3,4</sup>, Cecilia Baraldi<sup>1</sup>, C. Dejoie<sup>2</sup>, P. Martinetto<sup>3,4</sup> and P. Walter<sup>5</sup>

<sup>1</sup>Department of Life Science, University of Modena and Reggio Emilia, Via Campi 103, Modena, Italy

<sup>2</sup>European Synchrotron Radiation Facility, 71 Avenue des Martyrs, 38000 Grenoble, France

<sup>3</sup>Univ. Grenoble Alpes, Inst NEEL, 25 rue des Martyrs BP 166, 38042 Grenoble, France

<sup>4</sup>CNRS, Inst NEEL, 25 rue des Martyrs BP 166, 38042 Grenoble, France

<sup>5</sup>UPMC Univ Paris 06, CNRS, UMR 8220, Laboratoire d'archéologie moléculaire et structurale (LAMS), Sorbonne Universités, F-75005 Paris, France

[mariacristina.gamberini@unimore.it](mailto:mariacristina.gamberini@unimore.it)

The aim of our project is to identify and describe the structure of the main phases found in ancient pigments dating from the Roman period, in particular from Italian and Sicilian archaeological sites. We focus in particular on black pigments possibly used as cosmetics, paintings or inks. Several black powders from different contexts have been considered: 15 samples from Italy, Salinas Museum (Palermo), 12 from Mozia island, 2 from Baglio museum (Marsala), 5 from Ercolano excavation and 31 found in Pompeii [1] The samples were found in different types of containers (cylindrical theca atramentaria, unguentaries and aryballoi), and analysed in order to characterize their elemental and structural composition. To do so, a multi-analytical approach was adopted, which involved the use of Fourier-transformed infrared spectroscopy, Raman, X-ray fluorescence and X-ray powder diffraction.

High resolution X-ray powder diffraction and X-ray fluorescence were performed on the ID22 beamline at the ESRF. Taking advantage of the high flux of the synchrotron, a batch of the most relevant samples, in sealed capillaries, was measured to identify the crystalline phases using complementary information from both diffraction and fluorescence signals. The diffraction data analysis indicates that the crystalline part corresponds mainly to quartz, calcite, gypsum or other non-black minerals. The black powders show a composition based mostly on the presence of carbon black. The additional inorganic components may give an indication of the everyday use of the pigments as writing inks, cosmetics or painting material [2]. Furthermore, the composition profile of the samples could be a starting point for reflection to link the content to the type of its container.

Keywords: FTIR, Raman spectroscopy, X-ray powder diffraction

## References

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